

The Explanatory Variables of Non-Performing Loans in Albania, During and After the Financial Crisis

Irini Kalluci

PhD Candidate, University of Tirana, Faculty of Economics, Rr. Elbasanit, Tirana, Albania

Abstract

The main objective of this study is to identify the determinants of non-performing loans in the Albanian banking sector during and after the global financial crisis. As the crisis changed a lot of equilibriums and set new ones, we find it interesting to focus on the identification of the main factors that have influenced credit risk in the Albanian banking sector for the period 2007-2017. The Ordinary Least Squares (OLS) method is applied to quarterly data for the Albanian banking sector, for identifying the determinants of credit risk (measured by non-performing loans ratio of the banking sector). Non-performing loans are affected mainly by macroeconomic factors such as economic growth rate, interest rates, foreign exchange rate, credit growth and crisis. Considerable effects have also the past values of the dependent variable. This paper aims to enrich the existing literature on determinants of non-performing loans, and particularly for Albania, where a larger dataset and the latest data are analyzed.

Keywords: non-performing loans (NPLs), credit risk, determinants, Albanian banking sector

1. Introduction

In the beginning of 2000s, the Albanian banking sector faced major changes in its structure and organization. After the privatization of the largest bank in the country and the entry of international banking groups in the local market, the competition among banks increased and the process of lending intensified. This rapid growth in lending came due to the catching-up process for approximating to developed countries' levels, starting from very low levels of lending (typical for ex-communist countries), but it was also a result of the larger demand from borrowers, needing more funds to adapt their life and businesses to new market economy conditions. During the period of credit expansion (2004-2008), the ratio of nonperforming loans was too low, under 5%. This is a normal phenomenon, as the ratio is measured by non-performing loans (numerator) to total loans (denominator). As the latter increased during the fast credit growth, the ratio remained at low levels. On the other side, this period was characterized by economic growth and the absolute level of NPLs (loans in arrears) was low, as the borrowers had the financial capacity to repay the loans. But with the global crisis outburst in 2008, a new trend was evidenced in Albania, the same as in every other country: the lending growth almost stopped and on the other hand, it was accompanied by a rapid growth of non-performing loans. This led to very high figures of NPL ratio, peaking at nearly 25% in 2014 (figure 1).

Most of the borrowers faced insolvency problems caused by the crisis and the economic slowdown. Another factor that influenced the growth of non-performing loans was the exchange rate shock, affecting especially those borrowers who have taken loans in currencies different from that in which they generate their income. More than 50% of foreign currency loans were unhedged against exchange rate risk¹.

Although the bad loans increase became more apparent immediately after the crisis outbreak (and the crisis surely affected the increase in the NPL ratio), this phenomenon was expected to happen in a certain moment for Albania, as according to IMF (2006): "Although with sharply growing loan volumes the fraction of nonperforming assets initially declines, this is mechanical and due to the fact that it takes time for new loans to develop performance problems. As the portfolio matures, NPL ratios will increase again, and are likely to rise above earlier levels". But as time passes and the loans portfolio matures, the NPL ratio begins to rise at fast pace, known in the literature as "ageing effect", under which default rates reach their peak 3-4 years after the loans are granted (Borio et al., 2001).

In 2015, an inter-institutional working group in national level (with the composition of representatives of several important Albanian institutions) was set up, which drafted a plan of measures to reduce the level of non-performing loans in the banking system. According to Bank of Albania's Supervision Annual Report, during 2016, some regulatory changes were undertaken by this institution, which consisted in clarifying the writing off process from the balance sheet, provisioning of immovable property acquired from the execution of non-performing loans collaterals, revising the regulatory framework to facilitate the sale of non-performing loans and some necessary improvements in the credit registry. The results of the measures taken are materialized in the notable reduction of NPL ratio, which reached to 14% at the end of 2017.

As this topic has gain lot of attention from different institutions, we find it reasonable to analyze in this study the behavior of non-performing loans and the factors that have determined/contributed to their trend over

¹ In 2009-2010, according to Bank of Albania's Supervision Annual Report 2010.

the past ten years.

2. Literature Review

The experience of different countries shows that credit risk has been the major cause of banks' problems, as it is the main risk that they face during their operations. This type of risk derives from deficiencies in the loan granting standards, poor risk management of loans portfolio, or from weak macroeconomic conditions of a country, which would result in difficulties for the borrowers to repay their debts. According to *Moretti et al. (2008)*, "credit risk has been a key focus ... as in many countries it remains the main overall source of risk for banks, as typically reconfirmed by the stress tests themselves ... it is also a risk area in need of enhanced assessment and management tools". Consequently, the identification of the factors that affect this kind of risk is a matter of priority and importance at nowadays.

A wide literature is dedicated to the topic of defining the determinants of non-performing loans in different countries, aiming to derive relevant proposals to the policymakers in order to take the necessary steps for reducing bad loans.

Keeton and Morris (1987) presented one of the first papers of the literature on non-performing loans determinants. They found that local economic conditions affected the volatility of banks' loans losses.

Blaschke et al. (2001), measured the effect of some macroeconomic factors (such as real GDP growth, interest rates and inflation) on non-performing loans ratio (as a measure of credit risk). They suggest that the coefficients of the equations can be used for stress-tests purposes.

Kalirai and Scheicher (2002) used Ordinary Least Squares regressions to evidence the potential links between credit risk (measured by loan loss provisions) and a set of indicators for the Austrian economy, during the period 1990-2001. They classified the large dataset of variables, into six main categories: cyclical, price stability, household, corporate, financial market and external indicators. The authors found significant links between the dependent variable and short-term interest rates, stock markets indices, business confidence index, industrial production, money growth and exports.

Louzis et al. (2010) used dynamic panel data method, for identifying the determinants of NPLs in the Greek banking sector, separately for consumer, business and mortgage loans. They found that NPLs are mainly influenced by macroeconomic factors such as GDP, interest rates and unemployment and from the bank specific factors, they found as significant, the effect of management quality. Macroeconomic factors have different quantitative impact on different types of loans where non-performing mortgages show the least reaction towards these factors.

Klein (2013) analyzed the NPLs in Central, Eastern and Southeastern Europe (CESEE) during 1998–2011 period. The author concluded that the level of NPLs is influenced by both macroeconomic and banks' specific factors, but the latter have a relatively low effect. The estimation showed that on one side, NPLs are influenced by macroeconomic indicators (such as GDP growth, inflation and unemployment), and on the other side exist strong feedback effects from the banking system NPLs to the real economy. The credit growth rate results to higher NPLs in the following periods. The author found high auto-correlation of NPLs, with a coefficient's value of the lagged NPLs ranging between 0.6 and 0.93, thus suggesting a prolong effect of a shock to NPLs on the banking system.

Jakubík and Reininger (2013) presented a macroeconomic model for NPLs for the CESEE countries. They concluded that economic growth is negatively correlated with NPLs. They found also other important determinants that affect the change in NPL ratios for these countries, such as past credit growth and exchange rate changes.

Škrabić Perić and Konjušak (2017), in a study for 11 CEE countries during the period 1999-2013, investigate the influence of bank-specific and macroeconomic variables, but the most important focus is on the effect of credit growth on NPLs. They find negative effect of ROA on NPLs, while the size seems not statistically significant. Macroeconomic variables such as GDP growth and interest rate show significant links to NPLs. This paper also takes into consideration the implications of credit growth on NPLs and finds that the effect of this growth will be materialized after two years on the NPLs growth.

Rajha (2016), using panel data regression, investigates the macroeconomic and bank specific determinants of non-performing loans for the Jordanian banking sector. The results show that NPLs were positively affected by bank specific factors, such as the lagged NPLs and loans-to-total assets ratio. Economic growth and inflation rate were the macroeconomic factors that influence negatively the NPLs. An important role played also the global financial crisis in Jordan, which lead to higher NPLs.

The literature studying the behavior and determinants of non-performing loans in Albania has increased in the last decade. Different authors paid special attention to macroeconomic or microeconomic indicators, which are expected to affect the credit risk (measured by NPLs).

So, *Shijaku and Ceca (2011)* find significant correlations between changes in the lek/euro exchange rate, the euribor rate, and a small effect of economic growth over the NPL ratio.

Kalluci and Kodra (2011) identify the macroeconomic determinants of total NPLs during the period 2002-2009, and also for NPLs of businesses and individuals, which was a novelty for Albania. They find significant positive relationships of total NPL ratio with the lagged NPL ratio, interest rates, exchange rate and rent price indices. The dependent variable is negatively affected by money and exports growth, and house prices. The same effect is noticed in different subcategories of NPLs: businesses and individuals. Bad loans of business borrowers are also affected by GDP growth.

Nazaj and Meka (2012), through their analyses, identified the most specific causes of non-performing loans such as the lack of economic growth, decreasing level of remittances, high level of deferred or even unpaid government obligations to businesses, as well as the pattern of loan-making applied by the Albanian banks.

Shingjergji (2013) analyzes the impact of the main macroeconomic variables in the level of NPLs for Albanian banking system. This study is motivated by the hypothesis that macroeconomic variables have an effect on the non performing loans' level. The author used a simple regression model and found a positive relation of the non-performing loans ratio with the GDP (when expecting a negative one), the euro/ALL exchange rate and with a lagged interest rate, while noticed a negative coefficient for the inflation rate.

Shingjergji and Shingjergji (2013), through simple regressions, analyze the NPLs in the Albanian banking system and their relation with macroeconomic factors and some banking factors. They found a positive effect of the real effective exchange rate, of GDP growth in previous periods and of the share of loans in banks' total assets, on NPLs. The real interest rates (with a weak effect), the credit growth of the period and of the previous periods, inflation and GDP growth of the period, negatively affect the non-performing loans.

Boduri (2014) demonstrated a negative correlation between the real economy and the non-performing loans rate in the Albanian banking sector, based on empirical analysis, in regard to data for the period 1999-2013. The author concluded that banks should analyze carefully the progress of the economic cycle for ensuring financial stability, to protect against systemic risk and prevent the growth of non-performing loans.

Turan and Koskija (2014) analyzed the non-performing loans for the period 2003-2013 and found negative relationships of the latter with real GDP, interest rates (differently from the international experience), remittances and inflation. Positive relation is evidenced with the unemployment. The authors found a weak co-integration in the long run, of the dependent variable and the other five explanatory variables.

Baholli et al. (2015) focused on the analysis of credit risk in the Albanian banking system, which is counted as 60-70% of total risk exposure. The authors make a parallel comparison between NPL determinants in the case of Albania and Italy. They conclude that lending increase will affect the increase of NPLs too. While GDP growth affects negatively the level of non-performing loans for both countries. The depreciation of Albanian domestic currency makes more expensive FX loans and the repayment of loans, thus increasing NPLs. Interest rate has a negative impact for Italy, different from the findings of other authors, as an increase in the cost of loans, will be expected to increase the level of NPLs.

Nurja and Kufo (2016) give a special attention to the effect of governmental policies materialized in corporate taxes, on non-performing loans. They also test for the effect of other macroeconomic variables, such as GDP growth rate, inflation rate and interest rate. They found a statistically important impact of interest rates on non-performing loans. On the other side, the corporate tax is statistically significant at 90% confidence level, but they conclude that future research is needed on this indicator's effect.

This paper intends to add new facts to the literature on credit risk for Albanian banking sector. It includes the period during and after the financial crisis, with the latest data ever included in this type of studies for Albania. It also includes an indicator of credit growth and a dummy for the financial crisis, to capture their effect on the level of NPLs.

3. Data and methodology

3.1 Equation specification

In this study we will estimate two equations: equation (1) and (2). Equation (2) includes the same explanatory variables as equation (1), but the data start from 2005 and the GDP growth variable is substituted by a credit growth variable, to capture the effect of credit growth on the dependent variable. The two equations are specified as follows:

$$NPL_RATIO_t = \beta_0 + \beta_1 \cdot NPL_RATIO_{t-1} + \beta_2 \cdot GDP_GROWTH_{t-2} + \beta_3 \cdot INT_RATE_{t-3} + \beta_4 \cdot REER_{t-2} + \beta_5 \cdot UNEMPLOYMENT_{t-2} + \beta_6 \cdot DUMMY_CRISIS + \varepsilon_t \quad (1)$$

and

$$NPL_RATIO_t = \beta_0 + \beta_1 \cdot NPL_RATIO_{t-1} + \beta_2 \cdot CREDIT_GROWTH_{t-4} + \beta_3 \cdot INT_RATE_{t-3} + \beta_4 \cdot REER_{t-2} + \beta_5 \cdot UNEMPLOYMENT_{t-2} + \beta_6 \cdot DUMMY_CRISIS + \varepsilon_t \quad (2)$$

where:

NPL_RATIO – is the dependent variable calculated as the ratio of non-performing loans to total loans, for each quarter.

NPL_RATIO_{t-1} – is the lagged dependent variable by one quarter;

GDP_GROWTH – is the annualized real GDP growth rate;
CREDIT_GROWTH - is the annual growth rate in total loans' portfolio;
INT_RATE – is the weighted interest rate of new loans granted during a certain quarter, minus the inflation rate;
REER - is the logarithm of real effective exchange rate;
UNEMPLOYMENT - is the unemployment rate for a certain quarter;
DUMMY_CRISIS – is equal to 1 for the period 2008q3-2013q2 and 0 otherwise, tending to capture the increase in NPL ratio since the start of the financial crisis;
 β_0 - is the constant term;
 β_i – are the coefficients of the estimated equations;
 ε_t – is the error term.

3.2 Data

This study includes quarterly data from 2007Q4 up to 2017Q4, for equation (1) and the period 2005Q4-2017Q4 for equation (2). The two equations are estimated by the Ordinary Least Squares method. The dependent variable is the non-performing loans ratio of the banking sector. The data are provided from Bank of Albania and INSTAT websites. The descriptive statistics of these variables are presented in table 2.

All the variables used in the following equations were tested for unit roots and resulted that they become all stationary in first differences, so they follow an I(1) process (see table 3). For this reason, variables entered the equations as first differences, except for GDP and credit growth. These two variables are growth rates, so they enter in the equations as growth rates and not as differences of first order. The NPL ratio, credit growth and the unemployment rate are in nominal terms; while the GDP growth rate, the interest rates, and the real effective exchange rate are in real terms. The variables entered in the equations with the time lags specified in equations (1) and (2) above.

3.3 Hypothesis raised for this study

Based on the existing literature but also on our judgment, we will test the hypothesis as below explained.

3.3.1 Lagged dependent variable

Based on previous studies on credit risk, it is evidenced that NPLs follow an autoregressive process (i.e. Klein (2013), Jakubík and Reininger (2013)). In this context, we include in the equation the lagged value of NPL ratio, and we expect a positive sign of its coefficient.

H1: Non-performing loans are positively related to their lagged value.

3.3.2. Economic growth

Gross Domestic Product (GDP) is expected to have a negative relationship with NPLs. During times of economic growth and prosperity, the borrowers have larger capacity to repay their loans and better expectations for the future, which will reduce the level of bad loans. The opposite was evidenced during the financial crisis, when the ratio of NPLs reached its peak. In this respect, the hypothesis is:

H2: Non-performing loans are expected to have a negative relationship with GDP.

3.3.3. Interest rates

A higher interest rate means higher costs and larger installments for the borrowers to pay back to the banks. Based on this analysis, higher interest rates would result in larger levels of non-performing loans, as the borrowers should pay more money to the banks. We raise the hypothesis:

H3: Non-performing loans are positively related to interest rates.

3.3.4. Exchange rate

We use in the estimations the real effective exchange rate, which shows the relative price of domestic currency (Albanian lek – ALL), towards the price of other currencies of countries which are the most important trade partners of Albania. An increase in REER means a depreciation of domestic currency. As the larger part of loan portfolio of Albanian banks has been denominated in foreign currencies during the period under analysis, the borrowers should pay back to the banks higher amounts (installments) converted into ALL. This increases the chances that borrowers face difficulties to service the debt, thus increasing the level of NPLs. On the other hand, if the loans are denominated in domestic currency, a depreciation of the latter means that borrowers must repay less money than they borrowed from the banks. Also, the depreciation of domestic currency makes Albanian exports cheaper, compared to other countries' goods and services. This would raise the income generated by business borrowers and their ability to service debt will increase. The two last scenarios would result in lower NPLs. In this respect, the relation of exchange rate on the NPLs is ambiguous and we will estimate it for Albanian data.

H4: Non-performing loans are significantly affected by the exchange rate.

3.3.5. Unemployment

Unemployment rate is an indicator that measures the ability of borrowers to repay debt. When more borrowers are unemployed, they would face more difficulties to return their obligations to the banks. As during crisis and

some years after the crisis, the Albanian economy was characterized by higher unemployment levels, and very high NPL ratio, we expect a positive relation of NPLs with unemployment. The hypothesis is:

H5: Non-performing loans are positively related to unemployment rate.

3.3.6 Financial crisis

Using a dummy for capturing the effect of financial crisis on the non-performing loans ratio in the Albanian banking sector, we expect that the effect of the crisis would materialize in higher NPLs. Thus, we hypothesize that:

H6: Non-performing loans are positively related to financial crisis effect.

3.3.7. Credit growth

In an alternative equation (eq.(2)), we add another variable (credit_growth), which aims to capture the effect of credit growth (especially during 2005-2008), on the non-performing loans ratio, due to the ageing effect explained above. In this case, we expect that the lagged credit growth would give its effect on higher NPLs, some periods after. The hypothesis that we test is:

H7: Non-performing loans are positively related to lagged credit growth.

4. Results

The results of two equations estimated, are presented in table 1 below.

Table 1: Equations results

Variable	Equation (1)		Equation (2)	
	Coefficient	t-statistics	Coefficient	t-statistics
Constant	-0.0400	-2.4578	-0.0354	-2.3771
NPL RATIO (-1)	0.5294	3.9821	0.4813	3.9071
GDP GROWTH(-2)	0.1203	2.7466		
INT RATE(-3)	-0.2942	-2.3017	-0.2388	-2.2252
REER(-2)	-0.1892	-3.6779	-0.1602	-3.5805
UNEMPLOYMENT(-2)	0.2158	2.1652	0.19112	2.0819
DUMMY CRISIS	0.0122	3.6564	0.0131	4.3305
CREDIT GROWTH(-4)			0.0144	3.1455
Adj.R ²	0.6663		0.6577	
F-statistic	14.3132		16.3714	
Durbin-Watson statistic	1.6867		1.7645	
No. of observations	41		49	

The results of two equations show that the NPL ratio is considerably affected by its lagged values. The value of the coefficient for the lagged NPL ratio is the highest among other variables' coefficients. This means that the larger is the NPL ratio in the past period, the higher will be its value in the following quarter. This finding is in line with other authors results (for example, Kalluci and Kodra (2011), Klein (2013), Jakubik and Reininger (2013)).

As explained in the previous sections, the literature of NPL determinants generally has evidenced negative links between GDP growth and NPLs, as during economic prosperity, the level of bad loans decreases. In our estimations, we find a positive relationship of these two variables. The effect of GDP growth is evidenced after two quarters in the NPL ratio. These findings (regarding the coefficient sign) are in line with results of other studies performed for Albania (Shingjergji (2013) and Shingjergji & Shingjergji (2013)), but also for other countries (Murumba (2013)). This relation may be explained by the fact that GDP growth during the period under analysis has not been adequate to cause a NPL decrease.

As seen from table 1, NPL ratio is negatively affected by the lending interest rates, where an increase by 1 percentage point (pp) in the latter causes a decrease by 0.23pp - 0.29pp in NPL ratio. This effect is evidenced with a time lag of three quarters. We expected a positive relation of NPLs and lending interest rates, as with the rise in interest rates, the borrowers' capacity to service debt, decreases. This finding is also evidenced in other studies for Albania (i.e. Turan and Koskija (2014), Baholli et al. (2015)).

A 1 percent increase in the real effective exchange rate (an increase in REER implies a depreciation of domestic currency) will decrease the NPL ratio by 0.16pp - 0.19pp after two quarters. The link between credit risk and the exchange rate is often ambiguous (positive or negative). The negative sign taken from eq. (1) and (2) shows that when REER increases (i.e. the domestic currency (lek) is depreciating), the level of exports of businesses operating in Albanian economy will increase, thus their repayment ability will increase too.

As expected, an increase in unemployment rate would result in higher NPLs after two quarters. The effect of unemployment increase would be reflected in the decreasing capacity of the borrowers to repay debt, thus resulting in increasing the level of bad loans.

The positive coefficient before the dummy variable (which captures the effect of the crisis) shows that the

financial crisis occurrence has increased the credit risk and this link is statistically significant. This is in line with Rajha (2016).

In equation (2), we added another variable to test for the effect of credit growth on NPLs. The value of the coefficient is low, but it is statistically significant. We found that credit growth gave its effect after four quarters. These conclusions are in line with other authors studies (see for example Škrabić Perić and Konjušak (2017)).

We performed some specific tests for the robustness of the results of the estimated equations. We conducted the LM test to examine the possible autocorrelation of the errors. The null hypothesis of the LM test is that there is no serial correlation up to the lag order. We included 4 lags in the test and the results (presented in table 4) showed that there is no serial correlation.

The White Heteroskedasticity test, allows us to test for heteroskedasticity in the residuals of the estimated equations. The results (table 4) show that the null hypothesis of no heteroskedasticity is accepted.

We also tested for the normality of the residuals and the results are shown in the histograms in figures 3.a and 3.b. Jarque-Bera testing for the normal distribution of the residuals shows that the null hypothesis of normal distributed residuals cannot be rejected.

We tested through CUSUM test for the coefficients' stability and the results are presented in figures 2.a and 2.b. The figures show that the cumulative sum of the recursive residuals remains inside the critical lines, evidencing stability of the coefficients.

5. Conclusions

Non-performing loans have been a debated issue of the global literature, mainly during and after the financial crisis. This has been also relevant for Albania, where the NPLs ratio experienced a significant increase since the crisis outburst. In these circumstances, we found it interesting to evidence the factors that stand behind the deterioration in the credit portfolio quality.

The results of this paper showed a large effect of the dependent variable's (NPL ratio) lagged values in defining the values of the current period for this indicator. GDP growth and unemployment are macroeconomic factors that positively affect bad loans' portfolio of the banking sector. We expected a negative link with GDP growth, but it seems that its growth especially in the years during and immediately after the crisis has not been sufficient to affect the reduction of NPLs. The continuation of national measures taken for the reduction of non-performing loans, accompanied by further macroeconomic policies that will foster economic growth, are expected to translate into reduced levels of NPL ratio in the future periods. The increase in credit portfolio positively affected the NPLs, but this effect is delayed after some periods, due to the "ageing effect" of the loan portfolio. This behavior of the two indicators is also evidenced in other studies. The financial crisis was one of the factors that affected the increase in non-performing loans, as the crisis influenced the economic growth, unemployment, exchange rate fluctuations, etc, with a direct impact on the dependent variable.

6. References

- Baholli, F., Dika, I., and Xhabija, Gj., (2015), "Analysis of Factors that Influence Non-Performing Loans with Econometric Model: Albanian Case", *Mediterranean Journal of Social Sciences MCSER Publishing, Rome-Italy*, Vol 6 No 1, January 2015.
- Blaschke, W., Matthew, T. J., Majnoni, G. and Peria, S. M., (2001), "Stress Testing of Financial Systems: An Overview of Issues, Methodologies, and FSAP Experiences", *IMF Working Paper* 01/88.
- Boduri, L., (2014), "Links between Non-performing Loans (NPL) and GDP Growth – Case of Albania", *European Academic Research*, Vol. II, Issue 9, December 2014.
- Borio C., Furfine C. and Lowe P., (2001), "Procyclicality of the financial system and financial stability: issues and policy options", *BIS papers* no.1.
- International Monetary Fund (2006), "Albania – Selected issues", Part III. Rapid credit growth in Albania, IMF country report no. 06/285.
- Jakubik, P. and Reininger, T., (2013), "Determinants of Nonperforming Loans in Central, Eastern and Southeastern Europe", Focus on European Economic Integration, Oesterreichische Nationalbank (Austrian Central Bank), issue 3, pages 48-66.
- Kalirai H. and Scheicher, M., (2002), "Macroeconomic stress testing: preliminary evidence for Austria". *OeNB. Financial Stability Report* 3: 58–74.
- Kalluci, I. and Kodra, O., (2011), "Macroeconomic determinants of credit risk: The case of Albania", published in the special workshop book "Economic policies in SEE: Design, performance and challenges", Bank of Albania.
- Keeton, W.R., and Morris, C.S., (1987), "Why Do Banks' Loan Losses Differ?", *Federal Reserve Bank of Kansas City Economic Review*, pp. 3–21.
- Klein, N. (2013), "Non-Performing Loans in CESEE: Determinants and Macroeconomic Performance", *IMF Working Papers*, WP/13/72, March 2013.

- Louzis, D. P., Vouldis, A. T. and Metaxas, V. L., (2010), "Macroeconomic and bank-specific determinants of non-performing loans in Greece: a comparative study of mortgage, business and consumer loan portfolios", *Bank of Greece Working Papers*, **No. 118**, September 2010.
- Moretti M., Stolz, S. and Swinburne, M., (2008), "Stress testing at the IMF", *IMF Working Paper*, **WP/08/206**.
- Murumba, I. (2013), "The Relationship between Real GDP and Non-performing Loans: Evidence from Nigeria (1995 – 2009)", *International Journal of Capacity Building in Education and Management (IJCBE)*, **Vol. 2, No 1**, 1-7, Dec. 2013.
- Nazaj, S. and Meka, E., (2012), "The trend of non-performing loans in Albania's banking sector - Causes – Challenges & Recommendations", Conference Paper, November 2012.
- Nurja, I. and Kufo, A, (2016), "Non-performing Loans and Government Taxes in the Albanian Banking System", *Mediterranean Journal of Social Sciences MCSER Publishing, Rome-Italy*, **Vol. 7 No 6**, November 2016.
- Rajha, K. S., (2016) "Determinants of Non-Performing Loans: Evidence from the Jordanian Banking Sector", *Journal of Finance and Bank Management*, June 2016, **Vol. 4, No. 1**, pp. 125-136.
- Shijaku, H. and Ceca, K., (2011), "A model for the credit risk in Albania", *Special Conference Paper Series of the Bank of Greece*, **No. 7**, February 2011.
- Shingjergji, A, (2013), "The Impact of Macroeconomic Variables on the Non Performing Loans in the Albanian Banking System During 2005 - 2012", *Academic Journal of Interdisciplinary Studies, MCSER Publishing-Rome, Italy*, **Vol 2 No 9**, October 2013.
- Shingjergji, A. and Shingjergji, I., (2013), "An analysis of nonperforming loans in the Albanian banking system", *International Journal of Business and Commerce*, **Vol. 2, No.6**, February 2013, pp.1-11.
- Škrabić Perić, B. and Konjušak, N., (2017), "How did rapid credit growth cause non-performing loans in the CEE countries?", *South East European Journal of Economics and Business*, **Volume 12 (2) 2017**, 84-95.
- Turan, G. and Koskija, A., (2014), "Nonperforming Loans in Albania", *Academic Journal of Interdisciplinary Studies, MCSER Publishing-Rome, Italy*, **Vol 3 No 3**, June 2014.
- www.bankofalbania.org
www.instat.gov.al

ANNEX

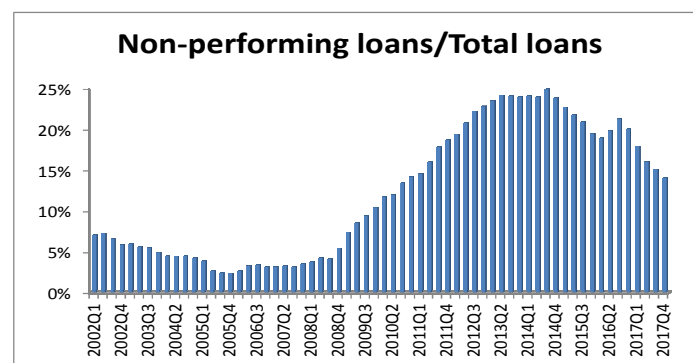


Figure 1: The trend of non-performing loans ratio.

Table 2: Descriptive statistics of variables used in estimated equations.

Variable	Mean	Median	Maximum	Minimum	St.Deviation
NPL ratio	0.1355	0.1458	0.2488	0.0234	0.0816
Credit growth	0.2211	0.1006	0.8496	-0.0309	0.2552
GDP growth	0.0352	0.0303	0.0987	-0.0128	0.0295
Real interest rate	0.0621	0.0625	0.0856	0.0359	0.0128
REER	106.0977	106.4190	114.0466	98.1758	5.3061
Unemployment rate	0.1440	0.1381	0.1817	0.1262	0.0156

(Source: author's calculations)

Table 3: Results of unit root tests for the variables used in equations.

Variable		Augmented Dickey Fuller Test			Phillips Perron Test		
		Intercept	Trend and intercept	None	Intercept	Trend and intercept	None
NPL ratio	Level	0.5606	0.9935	0.5813	0.6826	0.9984	0.6888
	First Diff.	0.0416	0.0688	0.0036	0.0536	0.1041	0.0050
GDP growth	Level	0.2032	0.1252	0.1325	0.3070	0.4325	0.1441
	First Diff.	0.0000	0.0003	0.0000	0.0000	0.0003	0.0000
Credit growth	Level	0.0339	0.5851	0.0019	0.8424	0.3241	0.2175
	First Diff.	0.0024	0.3496	0.3041	0.0043	0.0083	0.0004
Real interest rate	Level	0.2257	0.0200	0.2198	0.2823	0.0193	0.1610
	First Diff.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
REER	Level	0.4613	0.9707	0.5709	0.6105	0.9862	0.6329
	First Diff.	0.4256	0.4072	0.0815	0.0000	0.0000	0.0000
Unemployment rate	Level	0.5667	0.8489	0.5315	0.5280	0.8055	0.5449
	First Diff.	0.0001	0.0006	0.0000	0.0000	0.0003	0.0000

(Source: author's calculations)

Table 4: Results of serial correlation and heteroskedasticity tests performed for the equations.

	Equation (1)		Equation (2)	
	F-statistic	p-value	F-statistic	p-value
Serial correlation (LM test)	1.17	0.35	1.45	0.23
White Heteroskedasticity	1.28	0.32	2.24	0.06

(Source: author's calculations)

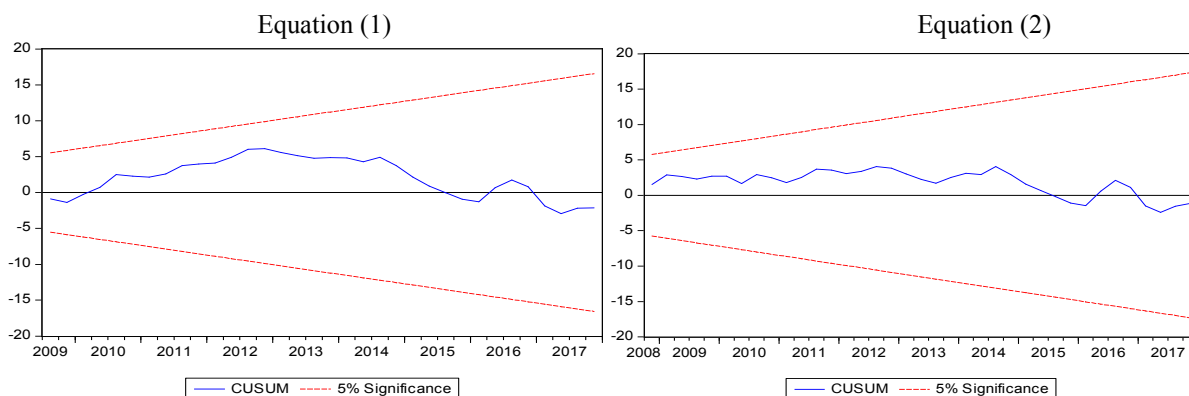


Figure 2.a and 2.b: Results for equations' coefficients stability tests.

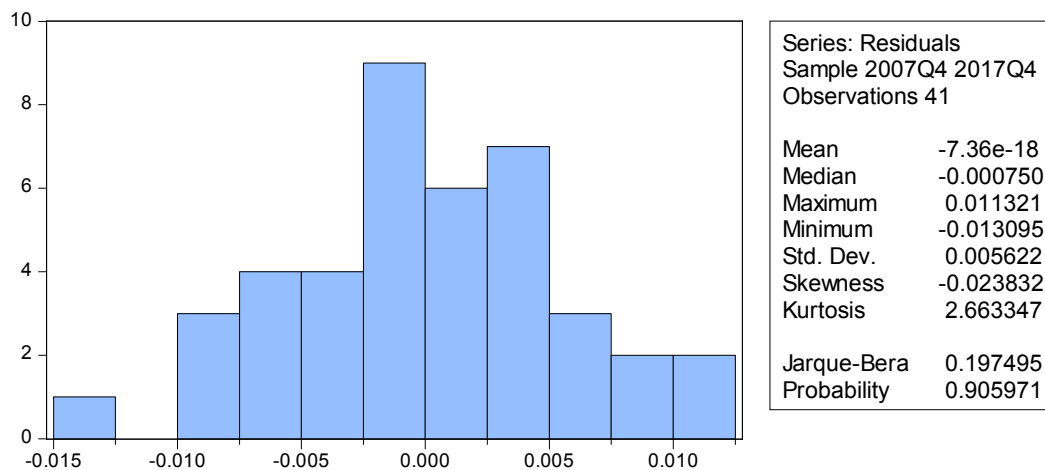


Figure 3.a: Histogram - normality test for equation (1).

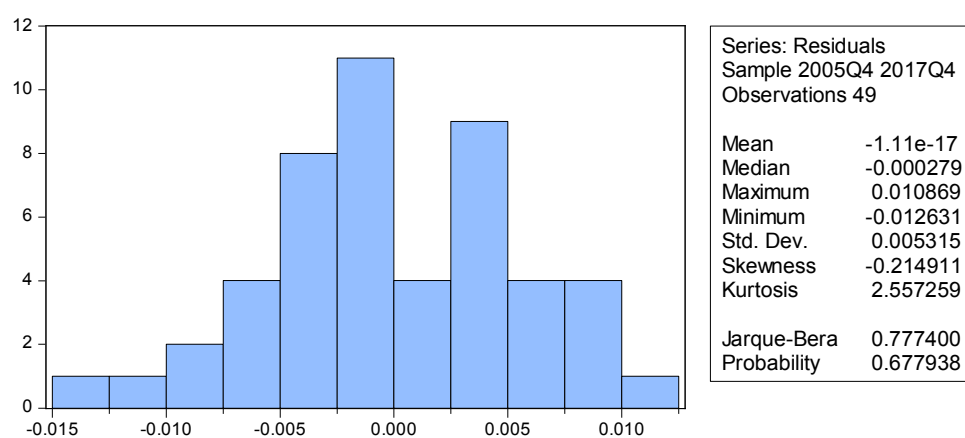


Figure 3.b: Histogram - normality test for equation (2).